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EXAMINER

SHECHTMAN, SEAN P

ART UNIT PAPER NUMBER

2125

DATE MAILED: 01/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|------------------------------------|--|
| Office Action Summary | Application No. 09/824,301 | Applicant(s) BODE ET AL. | |
| | Examiner Sean P. Shechtman | Art Unit 2125 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 11-15, 17, 18, 22-26, 28-37 and 41-44 is/are rejected.
- 7) ☒ Claim(s) 8-10, 16, 19-21, 27, 38-40 and 45 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-45 are presented for examination.

Claim Rejections - 35 USC § 112

2. Rejection withdrawn.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 2, 4, 6, 11-13, 17, 22-24, 28, 30, 31, 34, 41, and 42 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Pat. No. 6,169,931 to Runnels.

Referring to claims 1 and 28, Runnels teaches a method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool (Abstract; Col. 1, lines 13-19; Col. 7, lines 3-8; Col. 9, lines 24-29); a tool adapted to process wafers in accordance with the operating recipe (Abstract); receiving a tool event notification and initializing the control model in response to receiving the tool event notification (Fig. 9, element 902; Col. 14, lines 10-34).

Runnels clearly teaches a computer implemented system that employs a control model to determine the optimal operating recipe of the tool (Abstract). The tool is a CMP tool for polishing wafers in accordance with the operating recipe (Abstract). Runnels clearly teaches resetting the control model in response to receiving a notification of an event of the tool, wherein Runnels teaches resetting the number of wafers polished in the control model to zero (Fig. 9, element 902) in response to receiving a notification of the event that the solution for the optimal

tool recipe does not converge (Col. 14, lines 10-34). Examiner respectfully asserts that the resetting of the number of wafers polished in the control model is initializing the control mode. Examiner respectfully asserts that the event that the solution for the optimal tool recipe does not converge is a tool event notification, and further, this event occurs prior to actual implementation of recipe.

Referring to claims 2 and 31, Runnels teaches the system above, wherein initializing the control model comprises: estimating a control variable value (Fig. 9, element 907, “form a new guess for the optimal recipe”); and initializing the control model based on the estimated control variable (Fig. 9, element 902 is based on element 907; Col. 14, lines 10-34).

Referring to claims 4 and 34, Runnels teaches the system above, wherein the tool is a CMP tool adapted to planarize a semiconductor wafer (Abstract), and estimating the control variable includes estimating a material removal rate (Col. 2, lines 45-51; Col. 7, lines 3-25).

Referring to claims 6 and 17, Runnels teaches the system above further comprising: performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable (Fig. 9); and initializing the control model based on the control variable (Fig. 9, element 902 is based on element 908).

Referring to claims 11, 22, and 30, Runnels teaches the system above, wherein receiving the tool event notification comprises receiving a notification of a tool calibration (Col. 7, lines 5-12).

Referring to claims 12, 23, and 41, Runnels teaches the system above, wherein the tool is a CMP tool adapted to planarize a semiconductor wafer (Abstract), and receiving the tool event

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notification comprises receiving a notification of when the polishing pad is replaced (Col. 7, lines 13-25).

Referring to claims 13, 24, and 42, Runnels teaches the system above, wherein the tool is a CMP tool adapted to planarize a semiconductor wafer (Abstract), and receiving the tool event notification comprises receiving a notification of when the polishing pad is conditioned (Col. 7, lines 13-25).

4. Claims 1, 2, 4, 6, 7, 11, 13, 17, 18, 22, 24, 28, 29, 30, 31, 34, and 42 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Pub. No. 2001/0039462 to Mendez:

Referring to claims 1 and 28, Mendez teaches a method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool (Page 2, paragraphs 13-20); a tool adapted to process wafers in accordance with the operating recipe (Page 1, paragraph 3; page 2, paragraph 19); receiving a tool event notification and initializing the control model in response to receiving the tool event notification (See page 4, paragraphs 51-52 and then paragraph 50).

Mendez clearly teaches a CMP tool in a process control frame work to process wafers according to a control model that models the operating recipe of the tool (Page 2, paragraphs 13-20). Mendez clearly teaches event data that is CMP tool data is recorded in a database and this inputting of CMP event data triggers the updates in a component that adjusts another trigger component that updates parameters that clearly input as parameters to a logic component and used in a mathematical algorithm to calculate process parameters that modify a set of baseline

recipes (See page 4, paragraphs 51-52 and then paragraph 50). Examiner respectfully asserts that the triggering of parameters input to a mathematical algorithm to modify a recipe is initializing the control model in response to receiving the tool event notification.

Referring to claims 2 and 31, Mendez teaches the system above, wherein initializing the control model comprises: estimating a control variable value (Fig. 2, element 51, PSM parameters are predictive software model parameters); and initializing the control model based on the estimated control variable (Fig. 2, element 51; Page 4, paragraph 50).

Referring to claims 4 and 34, Mendez teaches the system above, wherein the tool is a CMP tool adapted to planarize a semiconductor wafer, and estimating the control variable includes estimating a material removal rate (Page 5, paragraph 58).

Referring to claims 6 and 17, Mendez teaches the system above further comprising: performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable (Page 5, paragraph 58); and initializing the control model based on the control variable (Fig. 2, element 51; Page 4, paragraph 50).

Referring to claims 11, 22, and 30, Mendez teaches the system above, wherein receiving the tool event notification comprises receiving a notification of a tool calibration (Col. 5, paragraph 57).

Referring to claims 13, 24, and 42, Mendez teaches the system above, wherein the tool is a CMP tool adapted to planarize a semiconductor wafer, and receiving the tool event notification comprises receiving a notification of when the polishing pad is conditioned (Page 5, paragraph 57).

Referring to claims 7 and 18, Mendez teaches the system above, wherein the tool is a CMP tool adapted to planarize a semiconductor wafer, and performing the qualification procedure comprises processing a test wafer in the CMP tool to determine a blanket wafer removal rate (Fig. 4-5; Page 5, paragraph 58 – Page 6, paragraph 64).

Referring to claim 29, Mendez teaches the system above, further comprising a process control server adapted to send the tool event notification to the process controller (Fig. 21, ethernet).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 35-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pub. No. 2001/0039462 to Mendez as applied to claim 29 above, and further in view of U.S. Pub. No. 2002/0147960 to Jevtic.

Referring to claim 35 and 36, Mendez teaches the system above further comprising: performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable (Page 5, paragraph 58); and initializing the control model based on the control variable (Fig. 2, element 51; Page 4, paragraph 50).

Referring to claim 37, Mendez teaches the system above, wherein the tool is a CMP tool adapted to planarize a semiconductor wafer, and performing the qualification procedure comprises processing a test wafer in the CMP tool to determine a blanket wafer removal rate (Fig. 4-5; Page 5, paragraph 58 – Page 6, paragraph 64).

Mendez fails to teach scheduling a qualification procedure on the tool.

However, Jevtic teaches analogous art, including scheduling for the periodic removal of wafers for testing (Page 1, paragraph 0005 of Jevtic).

Therefore, it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the system of Mendez to include the scheduling of Jevtic.

One of ordinary skill in the art would have been motivated to combine these references because Jevtic teaches computing an optimal schedule for moving wafers into defect control stations (Page 1, paragraph 0011 of Jevtic).

6. Claims 3, 5, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pub. No. 2001/0039462 to Mendez as applied to claims 1 and 31 above, and further in view of U.S. Pat. No. 5,659,467 to Vickers.

Mendez teaches all the limitations of the claims above and further, Mendez generally teaches a system and method for predicting software models using material-centric process instrumentation where a material is being processed (Page 1, paragraph 2).

Referring to claims 3, 5, 32, and 33, Mendez fails to teach the system above, wherein the tool is an etch tool or a deposition tool adapted to etch features or form a layer on a wafer and the control variable of the estimation is an etching rate or deposition rate.

However, referring to claims 3, 5, 32, and 33, Vickers teaches analogous art, wherein a tool is an etch tool or a deposition tool adapted to etch features or form a layer on a wafer and a estimating a control variable comprising estimating an etching rate or deposition rate (Col. 5, lines 32-44).

Therefore, it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teachings of Mendez with the teachings of Vickers.

One of ordinary skill in the art would have been motivated to combine these references because Vickers teaches a system that provides the ability to perform opportunistic maintenance of the equipment by identifying coefficients that are reaching limits, coefficients that are changing rapidly, and coefficients that are changing in parallel for supervised equipment such as deposition and etch equipment (Col. 5, lines 32-44; Col. 9, lines 50-56).

7. Claims 14, 15, 25, 26, 43, and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pub. No. 2001/0039462 to Mendez as applied to claims 1, 17, and 28 above, and further in view of U.S. Pat. No. 6,110,214 to Klimasauskas.

Mendez teaches all the limitations of the claims above and further, Mendez generally teaches a system and method for predicting software models using material-centric process instrumentation where a material is being processed (Page 1, paragraph 2).

Referring to claims 14, 15, 25, 26, 43, and 44, Mendez fails to teach the system above, wherein the tool is an etch tool or a deposition tool having a chamber and the tool event notification comprises a notification that the chamber has been cleaned.

However, referring to claims 14, 15, 25, 26, 43, and 44, Klimasauskas teaches analogous art, wherein the tool is an etch tool or a deposition tool having a chamber and the tool event notification comprises a notification that the chamber has been cleaned (Col. 4, lines 40-61; Col. 10, lines 4-6; Col. 1, lines 55-57).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teachings of Mendez with the teachings of Klimasauskas.

One of ordinary skill in the art would have been motivated to combine these references because Klimasauskas teaches a system for modeling and optimizing the maintenance of semiconductor processing equipment (Col. 1, lines 12-15). Furthermore, Klimasauskas teaches the system determines the type of maintenance to be executed and the extent to which maintenance can be postponed by changing process variables. Further still, Klimasauskas teaches the system determines potential modifications to process variables to improve the current performance of the processing equipment (Col. 3, lines 34-51).

Allowable Subject Matter

8. Claims 8-10, 16, 19-21, 27, 38-40, and 45 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Response to Arguments

9. Applicant's arguments filed September 27th 2004, with respect to the rejection of claims 1, 2, 4, 6, 11-13, 17, 22-24, 28, 30, 31, 34, 41, and 42 under 35 U.S.C. 102(e) as being anticipated by U.S. Pat. No. 6,169,931 to Runnels, have been fully considered but they are not persuasive.

Applicant argues that Runnels does not teach or suggest receiving a tool event notification. Runnels does teach receiving a tool event notification in Col. 14, lines 10-34. Examiner respectfully asserts that the event that the solution for the optimal tool recipe does not

converge is a tool event notification, and further, this event occurs prior to actual implementation of recipe.

Applicant argues that Runnels does not teach or suggest initializing a control model of a processing tool in response to receiving the tool event notification. Runnels does teach initializing a control model of a processing tool in response to receiving the tool event notification in Fig. 9, element 902 and Col. 14, lines 10-34. Runnels clearly teaches resetting the control model in response to receiving a notification of an event of the tool, wherein Runnels teaches resetting the number of wafers polished in the control model to zero (Fig. 9, element 902) in response to receiving a notification of the event that the solution for the optimal tool recipe does not converge (Col. 14, lines 10-34). Examiner respectfully asserts that the resetting of the number of wafers polished in the control model is initializing the control model.

10. Applicant's arguments filed September 27th 2004, with respect to the rejection of claims 1, 2, 4, 6, 7, 11, 13, 17, 18, 22, 24, 28, 29, 30, 31, 34, and 42 under 35 U.S.C. 102(e) as being anticipated by U.S. Pub. No. 2001/0039462 to Mendez, have been fully considered but they are not persuasive.

Applicant argues that Mendez does not teach or suggest receiving a tool event notification. Applicant argues that Mendez does not teach or suggest initializing a control model of a processing tool in response to receiving the tool event notification. Mendez does teach receiving a tool event notification in page 4, paragraphs 51-52 and paragraph 50. Mendez does teach initializing a control model of a processing tool in response to receiving the tool event notification in page 4, paragraphs 51-52 and paragraph 50.

Mendez clearly teaches event data that is CMP tool data is recorded in a database and this inputting of CMP event data triggers the updates in a component that adjusts another trigger component that updates parameters that clearly input as parameters to a logic component and used in a mathematical algorithm to calculate process parameters that modify a set of baseline recipes (See page 4, paragraphs 51-52 and then paragraph 50). Examiner respectfully asserts that the triggering of parameters input to a mathematical algorithm to modify a recipe is initializing the control model in response to receiving the tool event notification.

Conclusion

11. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sean P. Shechtman whose telephone number is (571) 272-3754. The examiner can normally be reached on 9:30am-6:00pm, M-F.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo P. Picard can be reached on (571) 272-3749. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SPS

Sean P. Shechtman

December 14, 2004


ALBERT W. PALADINI
PRIMARY EXAMINER